3.20 inches at Campden Hill, Kensington, and 3.37 inches at Barrow Hill, north of Regent's Park. Such falls in a short period have only been exceeded in the London area, so far as Dr. Mill has been able to ascertain, by 3.42 inches at Blackheath on July 23, 1903, and by 3.90 inches at Hampstead on April 10, 1878. On June 23, 1878, Mr. Symons recorded at Camden Square a fall of 3.28 inches in about an hour and a half; on Saturday last the recording gage showed that 2.86 inches fell in 2 hours, and no heavier rain has been recorded at ('amden Square in the 39 intervening years.

## GREATEST 24-HOUR RAINFALL AT WASHINGTON, D. C.

It is interesting to compare with these very exceptional falls under London's conditions, the following equally exceptional falls under Washington conditions, compiled by Mr. Herbert Lyman from the records of the Washington office of the Weather Bureau.

Greatest rainfalls for any 24 hours at Washington, D. C.

Inches.	Date.	Remarks.
5.80	1878, July 29-30.	
5.66	1874, Sept. 15-16.	
5.00	1904. Sept. 14-15.	
4.96	1898, Aug. 12.	
4.22	1905, July 5-6.	3.26 inches fell in 1 <sup>h</sup> 13 <sup>m</sup> .
4.16	1886, June 22.	
4.12	1876, July 30.	
3.98	1877, Oct. 4.	
3.92	1905, Aug. 25.	
3.67	1910, Oct. 19-20.	Not a thunderstorm fall.
3,50	1886, May 7-8.	
3.48	1900, June 2.	3.04 inches fell in 1 <sup>h</sup> 8 <sup>m</sup> .
3.34	1886, July 26-27.	
3.27	1917, July 25.	1.90 inches fell in 1 <sup>h</sup> .

To this table must be added the remark that in 1906 2.46 inches fell within 56 minutes on August 24.—c. A., jr.

## 551.51 (048) REVOLVING FLUID IN THE ATMOSPHERE.

By Sir Napier Shaw.

[Abstract of an address before the Royal Society, June 21, 1917.]

It is generally assumed, as appears prticularly from a recent paper by Lord Rayleigh,2 with reference to a former paper by Dr. J. Aitken, that the motion of air in cyclones and anticyclones may be classed as the motion of revolving fluid, symmetrical about a vertical axis. Reasons are given to show that this assumption with regard to cyclones and anticyclones of middle latitudes is erroneous; that circular isobars on the map do not indicate revolving fluid, and, vice versa, that traveling revolving fluid would not be indicated by a system of circular isobars. The next point for consideration is how a mass of revolving fluid traveling with a speed of translation of the same order as the speed of rotation, and of sufficient size, would be represented on a map. Diagrams are drawn showing the distribution of velocity in four cases for different ratios of the velocity of translation to the velocity of rotation, and assuming that systems of velocities could be fitted to pressure lines of the same shape, it is inferred that cases of traveling revolving fluid would be indicated by isobars similar to those which are classed meteorologically as belonging to small second-

## MOTION OF A PARTICLE ON THE SURFACE OF A SMOOTH ROTATING GLOBE.1

By F. J. W. WHIPPLE.

[Reprinted from Science Abstracts, Sect. A, Aug. 30, 1917, § 721.]

The free motion of a particle over a smooth rotating globe has not in the past received much attention, but the author considers that a knowledge of the motion of such a particle will prove a useful preliminary to a proper understanding of the more complicated motion which actually occurs in winds, where the air particles have other forces besides that of gravity acting upon them. After briefly dealing with the case of a particle on a smooth rotating sphere, the case of a globe having a "level" surface is considered. During the motion of the brightness of the surface is considered. face the relative speed remains constant. If the velocity is small so that variation in latitude is negligible the track is a circle and the period of the motion relative to the surface of the globe  $\frac{1}{2}$  cosec  $\phi$  days (where  $\phi$  = latitude.)

Where variations of latitude must be taken into account the general equations are worked out, but before a complete solution can be found it is necessary to assume that  $\phi$  is small throughout the motion. The equations are thus approximate only and must not be used for high latitudes. The solution then falls into 3 classes according as constant C is positive, zero, or negative. The value of C is governed by the initial motion and starting point

of the particle.

The results are illustrated by curves which show the motion of a particle given the velocity of 10 m./sec. over a globe having the dimensions of the earth. The first set of curves (C positive) give oscillatory paths backward and forward across the equator. In the second set (C=0) after a looped path the particle approaches the equator asymptotically. In the third case (C negative) motion is confined to one side of the equator. An approximately circular path is followed out, but with a gradual drift to the westward.—J. S. Di[nes].

## MOTION OF THE AIR IN THE LOWEST LAYERS OF THE ATMOSPHERE.2

By G. HELLMANN.

[Reprinted from Science Abstracts, Sect. A, Aug. 30, 1917, § 732.]

From measurements of the wind velocity at five different heights up to 258 meters above the ground at the

aries, or distortions of the isobars, generally on the southern side of the great cyclonic systems. Conditions are next considered which must exist if a column of rotating fluid is maintained and transported within a current represented by the isobars of a great cyclonic depression. The conditions arrived at are briefly: (1) That the velocity of translation must be the velocity corresponding with the separation of the isobars of the main depression unaffected by the presence of the revolving mass. (2) The column must probably extend throughout the troposphere, otherwise it could not be "capped." (3) The velocity of the current transporting the revolving fluid must be the same at all heights. This condition is shown to be satisfied if the line of lapse of temperature with height in the atmosphere corresponds with an adiabatic line, and this is known to be approximately the case in a cyclonic depression where convection has been ubiquitous and vigorous.

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Abstract published in this Review August, 1917, pp. 413-414.—C. A., jr.

Philosophical Mag., London, June, 1917, 33:457-471.
Berichte, Preuss. Akad. Wiss., Berlin, 1917, 10:174-197.